BIBLIOGRAPHICAL NOTICE.

A Monograph of the Horny Sponges. By Robert von Lendenfeld. London: published for the Royal Society by Trübner and Co., 1889. 4to. Pp. 936, pls. 50.

Dr. von Lendenfeld, after qualifying himself as an authority on sponges by studying them under the supervision of Prof. F. E. Schulze, went to Australia and New Zealand, and spent some years in making a collection of these organisms. In the seas bordering these countries sponges with horny skeletons largely predominate, and this fact induced the author to devote special attention to these particular forms, with the primary idea of preparing a catalogue of those inhabiting the Australian seas; but finding that these embraced a large proportion of the entire group known to science, the project was extended so as to include the description of them as a whole, and with this view the collections were brought to England and worked out by the author in the British Natural-History Museum; and the large collection of these forms belonging to the Museum, many of them new, were at the same time studied and described in the present work, which has been published under the auspices of the Royal Society.

In the introductory part is a bibliographic list of publications relating to sponges generally, both fossil and recent, which contains 1641 entries. This list is in the main similar to that previously published by the author in 1886 in the 'Proceedings of the Zoological Society,' and thus revised it may be considered as a fairly complete list up to January 1888 of the literature which treats of this class.

The main body of the work is divided into two portions—an analytical, devoted to the systematic description of all the known horny sponges, which professes to give the plain empirical facts relating to the anatomy, physiology, and classification of each genus, without any reference to phylogeny or other hypothesis: and a synthetical part, which treats of the anatomy of sponges generally, and discusses their phylogeny, systematic position, and classification. The author regards the *genus* as the most important unit, and endeavours to include in the characters of each a complete *résumé* of the comparative morphology and physiology of all the species embraced within it. The particular characters are thus summarized:—(1) Historical Introduction, (2) Shape and Size, (3) Colour, (4) Surface, (5) Rigidity, (6) Canal System, (7) Skeleton, (8) Histology and Physiology, (9) Affinities of the Genus, (10) Statistics of the Species, (11) Key to the Species and Varieties, and (12) Distribution.

The author frankly acknowledges that sponges which possess the common characteristic of a horny skeleton cannot be considered as forming a natural order, since certain groups are more nearly related to other sponges which have not horny skeletons than to each other. Four main groups of horny sponges are distinguished: three of these are considered to be related to as many distinct families of

siliceous sponges of the order Cornacuspongiæ, Vosmaer, and these are placed in the *artificial* order Monoceratina, characterized by a soft ground-substance or mesoderm, with a supporting skeleton of spongin fibres, without proper spicules, but in some instances with flesh-spicules (microsclera), and with pyriform or sac-shaped ciliated chambers; in other words, they are siliceous Cornacuspongiæ, but without skeletal or proper spicules in the supporting skeleton, though in some instances still retaining minute flesh-spicules of the same types as in the more typical siliceous sponges. The fourth main group of horny sponges is a relatively small one; and it is considered as a *natural* order, allied to the siliceous Hexactinellida, and from this it is named Hexaceratina.

The first family of the artificial order Monoceratina, the Aulenidæ, includes but two genera, *Aulena* and *Hyattella*, and in the former of these the skeletal fibres are not only charged with sand-grains, so common in the fibres of horny sponges, but they possess true echinating siliceous spicules similar to those of the siliceous Desmacidonidæ: and the author acknowledges that the genus is placed with horny sponges not because it properly belongs to this group, but because it furnishes an interesting and important link between the typical horny sponges and typical siliceous Desmacidonidæ.

The second family of the Monoceratina, the Spongida, is the largest of the three groups, and, as defined by the author, contains seventeen genera. The sponges of this family are not clathriform; they have small spherical or pear-shaped ciliated chambers, ·02 to ·05 millim. wide; the ground-substance or mesoderm is granular in varying degrees, and the horny fibres of the reticulating skeleton may be solid or pithed, and, of course, destitute of proper spicules. These sponges are regarded as very closely related to the siliceous Chalinids, and in fact merely their modified descendants, which have lost the ancestral spicules whilst retaining their external form and appearance for a protective purpose. It is significant to find that the mere relation of the *size* of the ciliated chambers is adopted by the author as a distinguishing feature, and in certain genera also the *dimensions* of the fibres and the skeletal meshwork are regarded as good generic characters.

Within this family are embraced the sponges of commerce, belonging to the genera *Euspongia*, Bronn, and *Hippospongia*, Schulze. These genera are very closely allied and connected by numerous transitional forms which run into each other at every point, so that it is an almost impossible task to establish satisfactory species or varieties; but in spite of this the author finds it necessary to make nine new forms in *Euspongia*, bringing the number in this genus to thirty-one, and six new in *Hippospongia*, which now numbers twenty-seven species and varieties.

A full account is given of the peculiar filamentous bodies so abundant in the genus *Hircinia*, which have been the subject of very varied opinions amongst spongologists, some considering them to be parasitic organisms, others that they have been produced by the sponge itself. Lendenfeld formerly held that they were foreign organisms, Oscillarians, which multiplied in the sponge and became

invested by a coating of spongin; but this view is given up as untenable, and, with Schulze, he now confesses himself unable to satisfactorily explain their origin; but it seems certain that, though not produced by the sponge, these filaments are in some way necessary to its existence, and may thus be compared with the zooxanthellæ or yellow cells frequently found in low forms of marine life. Curiously enough these filaments are, in the author's opinion, invariably associated with this genus of sponges and with no other, and they are as abundant in the Australian as in the Mediterranean species.

The sponges included in the Spongelidæ, or third main group of the Monoceratina, have a reticulate or dendritic skeleton of solid horny fibres without proper spicules, but containing foreign bodies and occasionally entirely replaced by large sand-grains; sometimes rod- or S-shaped flesh-spicules are present. The ground-substance or mesoderm is transparent, and the ciliated chambers are large and sac-shaped and do not possess special efferent canals. This group is more nearly allied to the siliceous Heterorhaphidæ of Ridley and Dendy, and includes only five genera, two of which, *Sigmatella* and *Haastia*, are new; the latter is somewhat remarkable in having a layer of minute oval siliceous bodies sheathing the fibre. The generic term *Spongelia*, Nardo, is preferred by the author to that of *Dysidea*, Johnston, on the ground of priority, and our English authors who retain Johnston's name are blamed for their ignorance of Nardo's works; but Dr. Lendenfeld does not seem to be aware that Nardo's term was unaccompanied by any description whatever, and is therefore invalid. As stated by Oscar Schmidt, the names given by Nardo must remain as shadows merely, since this author did not live to carry out his intention of describing the forms themselves; and though it pleased Oscar Schmidt to adopt some of them subsequently, *Spongelia* included, this would by no means be sufficient to displace the properly constituted term *Dysidea* proposed by Johnston before O. Schmidt published anything respecting the bodiless term *Spongelia*. Dr. Lendenfeld has another reason for preferring *Spongelia*, equally as valid as its assumed priority, viz. "because Schulze, who for the first time defined the genus in a really scientific manner, used that name."

In the remaining principal division of Lendenfeld's system, that of the order Hexaceratina, the sponges may have skeletons of pithed horny fibres, or of horny spicules, or they may be without skeletons at all. They are furnished with large sac shaped ciliated chambers, with simple canals. These sponges are regarded as forming a natural group, most closely allied to the siliceous Hexactinellida; but, judging from the distinguishing features of the three families which constitute the group, it is difficult to perceive in what way they are related to each other or to the Hexactinellida. Thus in the leading family, the Darwinellidæ, there are fibres and horny spicules, the next family of the Aplysidæ has fibres only in the skeleton, whilst in the third family of the Halisarcidæ there are neither fibres nor spicules.

Perhaps the most peculiar horny sponges are those included in

Darwinella, F. Müller, which possess a skeleton mainly of horny spicules detached from each other and irregularly scattered in the mesoderm of the sponge. Only two species are as yet known: in the first described, *D. aurea*, the spicules have from three to eight rays; some of them resemble the four-rayed or Calthrops spicules of siliceous Tetractinellid sponges, whilst others approach in form the six-rayed spicules of Hexactinellids. In the other species, *D. australiensis*, Carter, the large majority of the spicules have only three rays in one plane, and thus singularly resemble in form the three-rayed spicules so common in Calcisponges. The author concludes that these varied forms of horny spicules in *Darwinella* are directly derived from the siliceous spicules of the Hexactinellida in which the silica has been replaced by spongin; but there seems very little warrant for supposing that spicules so far removed from the Hexactinellid type as the Calthrops and three-rayed forms can ever have been derived from normal six-rayed Hexactinellid spicules: if they have been derived from siliceous sponges at all, they are more nearly related in form to Tetractinellid spicules.

Yet further, Dr. Lendenfeld states that the substitution of spongin for silica in these horny spicules has been brought about to meet the "exigencies of changed circumstances resulting from a migration from the siliciferous depths of the ocean to shallower water, where the amount of silica contained in solution in the water is not so great"! It may be asked if there is any reason for believing that the water of the ocean at great depths contains more silica than in shallower areas? Judging from the abundance of recent siliceous sponges in shallow and moderate depths, and from their enormous development under similar conditions in past ages, there is no ground whatever for supposing that the spicules of siliceous sponges would be at all likely to undergo substitution of spongin for silica through a comparative scarcity of this mineral in shallow water.

The author justifies the inclusion in Horny Sponges of such genera as *Halisarca* and *Bajulus*, in which there is no horny skeleton whatever, on the ground that they are rudimentary horny sponges: on the other hand, Schulze considers these forms as rudimentary Hexactinellids!

A total number of 248 distinct species and varieties are described in this work, of which no fewer than 258, or 74 per cent., are found in the Australian seas, whilst 179 species are limited to this region. Horny sponges are distinctively inhabitants of shallow water, the greater number occurring at depths between 20 and 50 metres, and the greatest depth at which they have been met with is 750 metres. They also flourish most in warm seas.

In the synthetical part of the volume the general results deduced from the empirical descriptions are discussed in a series of chapters in which the structure, classification, and systematic positions of sponges generally are treated. We can here only touch upon a few salient points, and one of these is the statement that the canal-system is the most important organ in sponges, and that it should principally be taken into account in classifying them. But is it not the fact that an essentially similar canal-system is present in many

sponges which are fundamentally different in the nature of their skeleton and in other respects, so that it would be quite impossible to classify them on this principle?

The discovery by Prof. C. Stewart of the rudimentary sense-organs or palpocils in sponges is referred to; but Dr. Lendenfeld claims that he was the first to *describe* these organs in sponges, and that he has discovered various modifications of a nervous system in horny as well as in calcisponges. An unimportant objection is made to the term "palpocil" for these organs; but the new one proposed seems hardly necessary. The stratification or layers noticeable in the horny fibres of sponges is attributed to the variable character of the spongin produced by the spongoblasts or fibre-cells at different intervals owing to changes in outer circumstances, and the production of pith in the fibres of the Hexaceratina is considered to be due to the action of cells which eat out the fibres and change the spongin into pith; but this theory has been called in question by Polejaeff, who considers the pith to be an original constituent of the fibres.

Regarding the physiology of sponges, the somewhat humiliating confession is made that we do not yet know the kind of food which is taken by them, nor how it is absorbed, nor the particular way in which the functions of secretion and respiration are carried on; and, further, but little is as yet definitely known of the embryology of horny sponges. As to the phylogeny of horny sponges, the author concludes that they have originated from four distinct phyla, which have been developed independently of each other from as many different groups of siliceous sponges. The system of the horny sponges set forth in this work is stated to be entirely new and fundamentally different from any previously propounded. The two concluding chapters deal with the phylogeny and systematic position of sponges generally, and the inevitable ancestral tree is produced —we are told for the first time—showing the relationship of the different families of the class. The author considers that the phylogenetic affinities of sponges are now established on a satisfactory footing, and the merit of this is modestly ascribed to four recent writers of the 'Challenger' Reports on these organisms and to the author himself.

Apart from hypothetical subjects, no doubt can be entertained of the value of this Monograph, as giving us for the first time full, detailed, and accurate descriptions of the minute anatomy and other structural characters of the group of horny sponges, so that in future there should be no serious difficulty in determining any member of it. Serious exception may be taken, however, to the arbitrary way in which, in many instances, the generic and specific names given by previous authors to many of these sponges have been disregarded and set aside by Dr. Lendenfeld in favour of new terms proposed by himself. It is indeed asserted that the sense in which the terms "variety," "species," and "genus" are used is the result of the author's own original researches and independent of any authority, and further that it is impossible to give a definition of his own peculiar meaning of them; but such a plea will not excuse the autocratic way in which new names are proposed by which previot

ones are either rejected or ingeniously relegated to such a subordinate position that they are likely to be altogether lost sight of.

The work is illustrated by a few woodcuts in the text and fifty plates; some of these are from photographs of dry or spirit specimens, others, representing the minute structures &c., have been drawn by the author. These latter in many instances are somewhat crude in appearance; but their lack of artistic merit may perhaps be compensated by greater accuracy of detail. Dr. von Lendenfeld may be congratulated on his good fortune in obtaining the assistance of the Royal Society to bring out such an important and, judging from the price set upon it, expensive publication.

MISCELLANEOUS.

On the Discovery of a Jurassic Fish-Fauna in the Hawkesbury Beds of New South Wales. By A. Smith Woodward*.

A large collection of fossil fishes from the Hawkesbury-Wianamatta series of Talbralgar, New South Wales, has been forwarded to the author for examination by Messrs. C. S. Wilkinson and R. Etheridge, Jun., of the Geological Survey of New South Wales. The final results will appear in a forthcoming memoir to be published by that Survey; but the investigation has already proceeded so far as to justify the announcement of the discovery of a typically Jurassic fish-fauna in Australia. Fine examples of the Palæoniscid genus *Coccolepis* occur, and this has previously been met with only in the Lower Lias of Dorsetshire, the Purbeck Beds of Wiltshire, and the Lithographic Stone of Bavaria. A new fish allied to *Semionotus*, but with thinner, much imbricating scales, is also conspicuous; and another new form, allied to the Dapedioids, is remarkable from the presence of typical rhombic ganoid scales in the front half of the trunk and deeply overlapping cycloid scales over the whole of the caudal region. A *Leptolepis*-like fish, with a persistent notochord, seems to represent a third unknown generic type. Of *Leptolepis* itself there are many hundreds of individuals in a fine state of preservation. The fishes occur in a hard, ferruginous, fissile matrix associated with well-preserved remains of plants.

The Fossil Fishes of the Hawkesbury Series at Gosford, New South Wales. By A. Smith Woodward†.

Some years ago an early Mesozoic fish-fauna was discovered in a bed of dark grey shale in the Hawkesbury Formation at Gosford, New South Wales, and the collection was forwarded to the author for determination. The present memoir comprises the results of

* Abstract of paper read before Section C, British Association, Leeds, 1890.

† Abstract of no. 4 of the 'Palæontological Memoirs of the Geological Survey of New South Wales,' Sydney, 1890.